## SYSTEM AND METHOD FOR AN EDUCATION DECISION SUPPORT LIBRARY

FIELD OF THE INVENTION

The invention relates generally to a system and method for providing an education

decision support library that enable individuals working in or associated with a learning

environment to access and analyze data relevant to the delivery of instruction and related

5      student services.  Specifically, the invention defines an information technology solution

that integrates methods and tools to transform operational school and student data into an

information resource customized for facilitating decisions that impact school

administration, curriculum, and/or individual student learning.

BACKGROUND OF THE INVENTION

10      School system administrators, principals, counselors, faculty members and support

staff make decisions that influence the learning environment either at a system-wide, local

school, or at an individual student level.  In making such decisions, administrators, faculty

and staff must often overcome obstacles related to either a lack of sufficient data or,

conversely, the need to organize an overwhelming quantity of data.  The inability to access

15      the right data at the right time or to acquire reliable, consistent and accurate data also

thwarts the efforts of faculty and staff to apply data in the decision making process.  For

example, a school administrator with a large and diverse student population may have

difficulty in determining the correlation between a number of factors, such as academic

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preparedness, student mobility, course enrollment, and student test scores on standardized

tests. An understanding of the relationships between these factors may influence staffing

decisions, funding for a local school program, and/or result in changes to a student's

academic plans.

5          In addition to the data issues described, faculty and staff must also contend with

the lack of adequate user-friendly tools to access, organize, and analyze data. Educational

institutions collect vast quantities of student demographic and performance data.

However, the format of this data is often ill suited for the average administrator, faculty or

staff member who lacks the sophisticated technical skills and/or time to gather and prepare

10       the data for analysis. Thus, administrators, faculty and staff must either make decisions

with insufficient or incomplete data or must delay decision making while computer

specialists, statisticians, or other staff members compile the required data.

The current decision support methods for education is a labor-intensive effort with

respect to data gathering and preparation. As a result, existing processes can not respond

15       rapidly in today's dynamic environment characterized by growth in student diversity;

increased student mobility; higher expectations from families, politicians, and industry;

competition from alternative educational providers; shortened life-cycle for instructional

technology; new research in learning methods; limited funding resources; impact of social

issues such as violence and substance abuse; and accelerated expansion of humanity's

knowledge in all fields of study. In such an environment, the decision support methods of

yesteryear are obsolete for today's educators.

A majority of current student information systems address only operational needs,

such as processing transactions related to the activities that occur during the school day or

5    satisfying static record keeping mandates. These systems provide insufficient methods to

support data analysis for educational decision-making. The invention resolves this

deficiency.

SUMMARY OF THE INVENTION

Hereinafter, features and advantages in accordance with embodiments of the

10    system and method of the present invention will be described. The description will be

provided in the context of an administrator, faculty, or staff member of an elementary

school, secondary school, special education center or special program center of a local

public school district. However, the invention is not limited to such environments. For

example, other educational institutions such as a private school, a state education agency,

15    a post-secondary education institution, or a professional development entity may employ

the invention.

In the course of delivering instructional and related services in an educational

institution, an administrator or educator makes a number of decisions that may impact a

single student, a small number of students, or the entire student population of the

institution. In order to make such decisions, the individual requires access to data that are timely, accurate, relevant and of sufficient granularity with respect to the issue.

For example, an administrator may need to make a decision regarding the remediation of a group of students or regarding strategies to improve a program's

5    effectiveness. A number of factors must be considered and analyzed in order to develop the optimal solutions to pursue. Data associated with student attendance, student academic readiness, student mobility, standardized test results, faculty professional development, instructional resource availability, and technology support may all be involved in the analysis.

10   One embodiment of the present invention provides the administrator with computer network access to a database containing such data. Using a commercially available browser, the administrator connects to the intranet site that serves as a portal to the decision support library. The library contains the student and school based data that is relevant to the forthcoming analysis. Furthermore, the library offers the administrator

15   software tools to facilitate data analysis. For example, after defining the student population in question, the administrator requests a comparison of the students' results from a number of standardized tests with the students' attendance records and with the students' membership data over the past couple of school years. The software tool responds to the request by gathering and loading the data into a multidimensional structure

that is suited for such comparison analysis. Once loaded, the administrator begins manipulating the data to quantitative results.

As the administrator discovers new relationships or facts in the data, the tool enables the administrator to expand his or her analysis. By supporting greater complexity

5   in analysis, the probability that the administrator will gain new or increased insight into the students' performance increases. For example, in an effort to understand student performance in similar and in different instructional settings, the administrator may wish to include additional factors, such as disciplinary actions, into the analysis. If the data is available in the education decision support library, then the tool easily locates the data and

10  expands the multidimensional structure with the new requested data.

The example illustrating an administrator's application of an embodiment of this invention highlights one of the primary features of this invention. Specifically, the invention defines a recursive method for preparing and transforming operational data into a decision support resource for educators. In one embodiment, the system and method of

15  the invention provides a technique for capturing data and rules; loading data from a variety of sources; filtering the data; and scrubbing (validating) the data in order to remove anomalies. Once the data has been scrubbed, the process of the invention transforms the data according to pre-defined rules. The transformed data are held in a staging area where dimensional indices are assigned to facilitate data retrieval and analysis. Finally, the

20  indexed data are migrated into the education decision support library database and, if

appropriate, into specialized multidimensional data structures.  Having created this

decision support data resource, the system and method of the invention further delivers

tools that enable users to perform a variety of on-line analytical processes and activities

such as report generation, longitudinal analysis, forecasting and data sharing.

5    BRIEF DESCRIPTION OF THE DRAWINGS

In order to provide a complete understanding of the present invention, reference is

now made to the appended figures.  These figures should not be construed as limiting the

present invention, but are intended to be exemplary only, wherein:

Fig. 1 is a schematic of the overall system according to one embodiment of the

10    system and method of the invention;

Fig. 2 is an example of source data according to one embodiment of the system and

method of the invention;

Fig. 3 depicts the data flow that results in the transformation of operational data

according to one of the embodiments of the system and method of the invention;

15    Fig. 4 shows an example of the transformation process used to process the data

according to one embodiment of the system and method of the invention;

Fig. 5 is an example of a user editing interface according to one embodiment of the

system and method of the invention;

Fig. 6 shows an example of a table used to process and store the data according to

20    one embodiment of the system and method of the invention;

Fig. 7 is an example of the fact tables used to process and store the data according to one embodiment of the system and method of the invention;

Fig. 8 is a schematic of a user interface according to one embodiment of the system and method of the invention;

5      Fig. 9 is a representation of a user interface according to one embodiment of the system and method of the invention;

Fig. 10 is an example of operational data or a data mart according to one embodiment of the system and method of the invention;

Fig. 11 is a schematic representation of a multidimensional data structure

10     according to one embodiment of the system and method of the invention;

Fig. 12 is an illustrative user interface showing a multidimensional data structure according to the one embodiment of the system and method of the invention;

Fig. 13 is a schematic representation of a multidimensional data structure that has been manipulated to display a graphical representation of the data according to one

15     embodiment of the system and method of the invention;

Fig. 14 is a diagram that depicts the movement of data from the operational data source to its availability as a decision support resource according to one embodiment of the system and method of the invention; and

Fig. 15 describes the overall workflow according to one embodiment of the

20     method and system of the invention.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will now be described in more detail with reference to

exemplary embodiments thereof as shown in the appended drawings. While the present

invention is described below with reference to exemplary embodiments, it should be

5      understood that the present invention is not limited thereto. Those of ordinary skill in the

art will recognize additional implementations, modifications, and embodiments, as well as

other fields of use, which are within the scope of the present invention as disclosed and

claimed herein, and with respect to which the present invention could be of significant

utility.

10      Fig. 1 is a graphic representation of the overall system according to one

embodiment of the system and method of the invention. As indicated earlier, a wide array

of individuals having different roles in an educational institution may use the invention. A

school system administrator who manages faculty and support staff is one example of a

user of the invention. As a user of the invention, the individual may also employ an

15      "agent". An "agent" is an executable object of limited artificial intelligence that performs

work in accordance with the instructions and rules embedded within its pre-defined script.

Thus, agents may access and employ the system and methods of the invention in order to

gather and deliver specific data. For example, an agent may deliver only the latest student

results for a particular standardized test whenever a particular event occurs.

In addition to earning acceptance by the user community, the success of the invention also depends on the alacrity and expertise of the data stewards. A "data steward" serves as the custodian of a set of data that are related to a particular subject domain, such as student membership, standardized tests, and special education programs.

5      As the data custodian, the data steward possesses expert "business" knowledge of the domain. Typically, the data steward has the legal accountability and responsibility for the accuracy, completeness, and security of the data.

In accordance with one embodiment of the method and system of the invention, Fig. 14 shows, in summary, the movement of data from an operational data source 24 to

10     its availability as a decision support resource. The operational data is loaded into an input area 40 of the staging database. Using a "conforming model" 26, the input data 40 is first cleansed in order to remove operational data peculiarities, such as process control flags, that are irrelevant from a decision support and/or data analysis context. After removing the irrelevant data elements, the cleansed data is loaded into the scrubbing area

15     41 of the staging database. The data in area 41 is scrubbed in order to identify and remove errors and other anomalies in accordance with predefined rules 28. The scrubbed data is loaded into the transformation area 42 of the staging database. During the transformation process, the area 42 data is reformatted and altered in accordance with the rules 28 in order to enhance its consistency and usability as a decision support resource.

20     The transformed data is loaded into the operational data store area 43 of the staging

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database. The resulting data in area 43 is a denormalized data structure that also includes

the dimensional keys of the education decision support library (EDSL) database 44. The

data in area 43 can be used to satisfy specific point-in-time types of reports. However,

the primary purpose of area 43 is to provide data that has been cleansed, scrubbed, and

5       transformed for loading into the education decision support library database 44. The data

architecture of the EDSL database 44 is a star schema that consists of a set of fact tables       .

surrounded by a set of reusable dimension tables. If enhanced access performance and/or

complex analysis, such as longitudinal analysis involving large quantities of data across

multiple dimensions, are required, then the EDSL data is loaded into a multidimensional

10      data structure 46. Data stored in a multidimensional data structure 46 has a specific

architecture or organization that enhances its suitability for use with sophisticated online

analysis processing (OLAP) tools.

Returning to Fig. 1, the focal point of the overall system is the education decision

support library 10 that is accessible over a network 22 through the use of a browser or

15      browsers 18. The education decision support library 10 may comprise of a centrally

located, processor based system or may be distributed across multiple servers. The

decision support library may also have network links to one or more data sources 12, 20.

The network links may be achieved as a local area network (LAN), a wide area network

(WAN), a wireless network, the Internet, or a combination, for example.

In some embodiments, the data sources may be classified as either an internal data

source 12 or as an external data source 20. Fig. 2 provides an example of one such data

source prior to its preparation and transformation into a decision support resource. The

primary observation regarding data sources 12 and 20 is that both may comprise of a

5    system that captures and retains data that supports a particular purpose. Thus, data sources

12 and 20 may contain either transactional data, reference data (e.g. normalized test scores

or U.S. census data) or data that has already been transformed into a decision support

resource (e.g. a financial data mart).

As depicted in Fig. 1, the decision support library may employ commercially

10   available software 16 such as ETL (extraction-transformation-load) tools, user analytical

tools and data modeling tools; data storage systems; and network communication devices.

ETL tools include any suitable software that enables users to extract, format and store

data. For example, ETL tools may include such commercially available products as

Informatica PowerMart Designer™ and Oracle PL/SQL™. Analytical and data modeling

15   tools include software that facilitates data access, computation, and/or publication.

Examples of such tools include Crystal Decisions Holos™ and Crystal Reports™; Oracle

Discoverer™, Viewer™ and Designer 2000™; Computer Associates ERwin™; Java; and

Strafford Technology Infogateway Portal™. In some embodiments, these software tools

may be distributed over multiple servers and accessible over the network. Access, in

some embodiments, is achieved through client browsers 18, such as Microsoft Internet

Explorer™ and Netscape Navigator™.

With respect to data storage 14 in Fig. 1, some embodiments may utilize multiple

data repositories. For example, one repository may serve to support the process of

5      transforming the operational data while another repository may contain the final products

of the transformation process. Thus, storage 14 may be any suitable system and device for

storing data electronically. One example of such a commercially available storage system

is the Oracle Enterprise Server™.

The analytic tools 16 may enable any number of data processing functions. For

10     example, analytic tools 16 may enable creation of relationship links between individual

data points, cleaning of data, updating of data, normalization of data, formatting of data,

mathematical processing of data, graphing, longitudinal analysis, restructuring data, and

comparison of different data, along with other functions.

In some embodiments, the analytic tools 16 may be distributed over several

15     processor-based devices, such as via the Internet and/or an intranet. Client\browser side

processor based devices, such as the client/browser 18 processor device, for example,

may include some, or all, of the analytic tools 16.

As noted above, some embodiments of the education decision support library 10

may communicate with one or more operational data sources 12, 20. For example,

20     operational data source 12 and operational data source 20 may communicate with the

education decision support library 10.  While two operational data sources 12, 20 are

indicated in Fig. 1, any number of sources is possible.  In some embodiments, operational

data sources 12, 20 may comprise an interconnected network, such as a local area network

(LAN), a wide area network (WAN), a wireless network, the Internet, or other type of

5      network, for example.

Communication between the operational data sources 12, 20 and the education

decision support library 10 may be accomplished in any suitable fashion.  For example,

communication may be over dedicated network connections (e.g., LAN, WAN, etc.), over

telephone lines (e.g., via modem), over a wireless network, over the Internet, or by manual

10      loading, such as by using a via floppy disk.

In some embodiments, operational data sources 12, 20 may include any suitable

data source that provides data that may assist an administrator, or other user, when making

a decision.  For example, operational data sources 12, 20 may comprise a system for

storing, retrieving, and managing large amounts of any type of data.  Operational data

15      sources 12, 20 may also comprise data marts and external data sources not inherent to an

enterprise, for example.

Data marts are subsets of the education decision support library that focus on a

specific subject or knowledge domain and that may exist independently as a separate data

resource.  A data mart may contain individual data or aggregated/ summarized data.  Data

20      marts may also be mobile (e.g., downloaded onto a mobile laptop or other mobile device

capable of storing the data). Data marts may also comprise historical data (e.g., membership), financial data (e.g., operational costs, salaries, and overhead, for example), human resources data (e.g., teacher certification, staffing, etc.), School Administration Student Information Cross Platform (SASIXP) databases (e.g., student grades, attendance

5    records, etc.), external benchmark sources (e.g., local, state, or national standard providers), or other sources of information. An example of data from an operation data source 12 is depicted in Fig. 2.

Further, the data mart may be a repository that is internal or owned by the institution, which is operating the EDSL. Alternatively, the data mart may be a repository

10    that is external or not owned by the institution and to which the institution has access. Further, the data mart may be a "mobile data mart" which may be characterized as a repository that resides on a personal computing device and that is created, maintained and/or accessed via mobile computing technologies.

Of course, the type of operational data source 12, 20 may vary with the nature of

15    the organization for which decisions are made (e.g., educational, enterprise level, government, etc.), the type of decision to be made (e.g., financial, legal, student achievement, organizational, etc.), as well as with a variety of other factors.

In some embodiments, the education decision support library 10 may also communicate with a network 22. As noted above, the network 22 may comprise any

suitable processor based network. For example, network 22 may comprise a LAN, WAN, wireless network, the Internet, an intranet, or other suitable network.

In some embodiments, network 22 enables education decision support library 10 to, among other things, communicate with client-side processor devices (e.g., via HTML,

5    JAVA designed interface, Web browser, etc.). For example, education decision support library 10 may communicate with client/browser 18 via network 22. In some embodiments, such as shown in Fig. 1, operational data sources 12, 20 may also communicate with education decision support library 10 and client/browser 18 via network 22 (e.g., using a browser interface and software such as Oracle Discoverer™).

10   As used herein, client/browser 18 may comprise any suitable processor device capable of communicating with education decision support library 10. For example, the client/browser 18 may comprise a workstation, a personal computer (PC), a laptop computer, a palm top computer (e.g., personal digital assistant (PDA)), browser, an Internet compatible cell phone or television, or other processor-based device.

15   In some embodiments, the client/browser 18 may comprise a processor device that is accessible by an administrator of an organization. For example, the client/browser 18 may comprise a terminal that is accessible by a school system administrator, school board member, principal, teacher, employee, manager, government official, an assistant or agent of any of the above, or other administrator. Administrators, or their agents, may use the

client/browser 18 to access education decision support library 10. As noted above, administrator access to education decision support library 10 may be via network 22.

Fig. 3 describes, in greater detail, the flow of data according to one embodiment of the system and method of the invention. The data transformation process commences at

5    step 200 with a transfer and receipt of data from the data source and into the staging database of the education decision support library. Data transfer may occur in any suitable manner. For example, data may be periodically uploaded via the network; copied from a disk or tape; or manually entered. Furthermore, step 200 may be evoked as a response to a business event, such as the end of the grading period; according to a regular schedule (e.g.

10   weekly, monthly, or yearly); or, by demand.

Using a "conforming model", the data received is cleansed in step 201 in order to remove operational data peculiarities, such as process control flags, that are irrelevant from a decision support and/or data analysis context. After removing the irrelevant data elements, the cleansed data is ready for scrubbing in step 202.

15   The scrubbing step 202 may be used to filter, modify, edit, update, and validate the cleansed data. In some embodiments of the invention, scrubbing 202 may also convert outdated file formats (e.g. historical data from legacy systems) to more usable formats.

The scrubbed data may be transformed at step 204. Transformation may comprise of any suitable routines that convert data into a format and organization that are suitable

20   for data analysis and decision support. Furthermore, in some embodiments, step 204 may

include the establishment of relationships between operational data points that assist in

validating or changing data. For example, reference table relationships and pointers may

be assigned to the data points in order to facilitate data manipulation, sorting, referential

integrity enforcement, and data correlation. Fig. 4 provides a sample of the transformation

5    process when an individual uses an ETL tool such as Informatica PowerMart Designer™.

Fig. 5 shows one embodiment of a data steward interface 1300. A data steward

interface 1300 may be provided to enable data steward access to operational data. The

data steward interface 1300 may comprise links 1302, or other process initiators, that

enable a data steward, or other administrator to transform operational data. The data

10    steward interfaces with the transformed data in order to edit, validate, and approve the

operational data. Additionally the data steward interface allows the data steward to

change the format of the raw data and set business rules to ensure that the information is

correct. For example if a student is 18 years old, the source record indicates that the

student is in the 9th grade when the student should actually be in the 12th grade. At this

15    point the data steward would correct the record.

Fig. 6 and Fig. 7 are tables that display samples of what the data structure may

look like after it has been through the transformation process, in accordance with one

embodiment of the method and system of the invention. The examples shown in Fig. 6

and Fig. 7 show the name of the data field, the type of data that the table will contain, and

if data is required to be entered into a field before the record will be excepted into the

table.

Returning to Fig. 3, once the data has been transformed, the data may be loaded to

the operational data store component of the staging database in step 208. The staging

5      database may comprise of any suitable storage system that stores data. In some

embodiments, the staging database may be located on the same server as the education

decision support library or may be located on a different server. The operational data

store may store the transformed data in domain, fact, or dimension tables. Domain tables

may contain code values used in operational systems, code values used only within the

10     decision support library, and textual description for each code values stored. Fact and

dimension tables reflect the star schema that has been defined for the education decision

support library.

Accordingly, after step 208, the process may pass to step 209. In step 209, the data

is loaded into the education decision support library (EDSL) database. The EDSL

15     database is based on a star schema architecture.

At step 210, the data may be loaded into a multidimensional data structure if the

user requirements and analytical tool demand such a structure. For example, data may be

presented as a cube with data relating to student ethnicity along one face, data relating to

student membership along another face, and school years along the remaining face. By re-

20     arranging the faces of the cube, the user may view the data from different perspectives.

In some embodiments, a user interface may be provided to facilitate access to the

educational support library over a network. Fig. 8 is a schematic of one possible user

interface that utilizes a commercially available browser. Fig. 9 provides another

embodiment of a user interface. In this example, the subject areas available in the

5 education decision support library are depicted as individual volumes of a book series.

The use of subject areas to group related data assists the user in locating specific data sets

within the education decision support library. Fig. 10 contains a sample of the possible

subject areas.

In some embodiments, a user interface may comprise typical browser features. For

10 example, as shown in Fig. 8, toolbar 302, banner 304, graphics 306, text links 308, and

other items may be included as part of the user interface. As shown, the interface 700 may

comprise tool bar 702, banner 704, graphics 706, text links 708, and other features.

For example, Fig. 9 shows one embodiment of an interface 700 having links 710 to

one or more administrative topics. In this embodiment, links 710 to a multidimensional

15 data structure for predetermined categories of data are designed to resemble book volumes

on a shelf 712. The volumes may include logistics 714, facilities management 716,

financial analysis 718, human resources 720, student achievement index 722, student

discipline 724, instructional management systems 726, strategic targets 728, student

grades 730, standardized tests 732, course enrollment 734, and student membership 736,

20 for example.

As mentioned above, one feature of the invention is to provide administrators, or

agents, with a multidimensioned data structure to enable the administrator or agent to

analyze the data. Fig. 11 is a schematic representation of a multidimensional data

structure according to one embodiment of the invention. As indicated, a multidimensional

5      data structure 400 may be presented using appropriate software (e.g., Crystal Decisions,

Inc. Holos™).

The multidimensional data structure may be presented in an appropriate interface.

In some embodiments, the interface may comprise a toolbar 402 or other functional

controls. For example, in some embodiments, data categories may be represented as

10     graphic tiles or emblems (e.g., 404, 406, 408, 414, 416, 418). Fig. 12 shows one

embodiment of a multidimensioned data structure 800 comprising a toolbar 802 and

operational data categories represented by graphic tiles 804, 806, 808, 814, 816, and 818.

In some embodiments, the user may arrange the tiles or emblems to create multi-

dimensioned charts or worksheet for analysis. For example, Fig. 11 shows one example of

15     a two dimensional chart showing a relationship between data category A (item 404) and

data category B (item 406). Fig. 12 shows one example of a two dimensional chart

demonstrating a relationship between Standards of Learning (SOL) test scores 804 and

Pine Spring elementary school 806.

In some embodiments, each category may comprise one or more subcategories

20     (e.g., subcategories $A_1$, ..., $A_n$ (item 408) and subcategories $B_1$, ..., $B_n$ (item 410). The

relationships between category A and category B, and the associated subcategories, may

be displayed in display field 412. For example, Fig. 12 shows subcategories of test results

808 (e.g., percent failed, percent passed/proficient, and percent passed/advanced) and

subcategories of test dates 812 (e.g., 6 May 1998, 24 May 1999, and 31 May 2000). Other

5      methods of presenting relationships between categories are possible. For example,

spreadsheets, worksheets, charts, graphs, and other techniques may be used to display

relationships between categories. Fig. 13 is one example of a graph generated using data

in multidimensional data structure 800.

Fig. 15 offers an example of one embodiment of the method and system of the

10     invention. Specifically, Fig. 15 depicts a process of transforming student membership

data from an operational data source into a decision support resource for use and storage

within EDSL. To complete the transformation process, a series of fourteen sequential

steps is performed in accordance with this embodiment of the methods and systems of

the invention . Each step must be successfully completed before proceeding to the next

15     step. The following table summarizes the objectives of each step.

| STEP | OBJECTIVES |
|------|------------|
| 1 | Receive from the data steward the membership period to be processed. Validate membership period by applying the data quality filters (rules). If the input conforms to all the rules, accept the membership period. If the input fails to conform to a rule, reject the membership period. |

| STEP | OBJECTIVES |
|---|---|
| 2 | For each attribute that is significant to the student membership area and that relies on a reference resource (e.g. planning units, schools, pyramids, years), refresh the reference:<br><br>    Load operational values from data source into an input domain table.<br>    Validate each entry in the input domain table by applying the data quality filters (rules).<br>    If an entry conforms to all the rules, load the entry into the appropriate domain table.<br>    If an entry fails to conform to a rule, reject the entry by loading the rejected entry into the appropriate anomaly data table.<br>    Require the data steward for the specified domain to resolve all anomalous entries. |
| 3 | For each attribute that is significant to the student membership area and that is represented as a domain (set) of codes, synchronize the operational code values and decision support code values:<br><br>    Insert new operational code values from data source into the operational domain table.<br>    Insert new decision support code values from the data steward into the decision support domain table.<br>    Permit data steward to modify and/or remove decision support code descriptions.<br>    Require the data steward to review all newly inserted operational code values.<br>    Require the data steward to specify the transformation rule for the conversion of each operational code value into a decision support code value and description.<br>    Retain the transformation rule in the decision support domain table. |
| 4 | Load student membership data for the membership period indicated from data source into an input data table. |
| 5 | Validate each student membership entry in the input data table by applying the data quality filters (rules).<br>If an entry conforms to all the rules, load the entry into the filtered data table.<br>If an entry fails to conform to a rule, reject the entry by loading the rejected entry into the anomaly data table. |
| 6 | For each student membership entry in the filtered data table:<br>    Assign the student to a facilities planning block per business rules.<br>    Assign the student to a facilities planning unit per business rules.<br>    Assign the student to a postal ZIP code per business rules.<br>    Determine the student's base school per business rules.<br>    Determine the student's school name per business rules.<br>    Determine the student's school's state agency classification per business rules.<br>    Determine the student's pyramid per business rules. |

| STEP | OBJECTIVES |
|------|------------|
| 7 | For each unique student identifier in the filtered data table:<br>    Retrieve the student membership facts from EDSL.<br>    Load the membership facts into the metric table.<br>For each student membership entry in the filtered data table:<br>    Compute a series of membership metrics (e.g. school year-to-date days present, school year-to-date days absent, total years of membership in school) per specified algorithms.<br>    Insert the computed metrics into the filtered data table. |
| 8 | Load all entries in the filtered data table into the transformed data table.<br><br>For each student membership entry in the transformed data table:<br>    For specified attributes, replace the operational code values with the decision support code value per the transformation rules in the decision support domain table.<br>    If a transformation fails due to the absence of an equivalent decision support code value, reject the entry by loading the rejected entry into the anomaly data table. |
| 9 | For each student membership entry in the transformed data table and for each specified EDSL dimension:<br>    Determine the dimension to which the entry should be assigned per business rules.<br>    If an existing dimension exists, assign the dimension key to the entry.<br>    If an existing dimension does not exist, insert a new dimension into the appropriate dimension work table and assign the key of the new dimension to the student membership entry. |
| 10 | For each student membership entry in the transformed data table:<br>    Determine if the entry qualifies as a new fact for EDSL.<br>    If the entry is a new fact, create an entry in the membership output table. |
| 11 | Require the data steward to review the quality of each entry in the membership output table.<br>Require the data steward to review each entry in the anomaly data table.<br>Subsequent to the processing of step 11, the process can go to 12A and/or 12B, since both step 12A and 12B can be done simultaneously. |
| 12A | Require the data steward to resolve all anomalies.<br>At the data steward's discretion, return to step 1 and repeat process. |
| 12B | At the data steward's discretion, refresh the EDSL dimension tables with the entries in the corresponding dimension work table in accordance with the specified business rules. |
| 13 | Refresh the EDSL student membership fact table with the entries in the membership output table in accordance with the specified business rules. |

| STEP | OBJECTIVES |
|------|------------|
| 14 | Load EDSL membership fact table and dimension tables into a multidimensional data structure<br>Publish new worksheets and reports |

TABLE 1

As illustrated in Fig. 15 and in Table 1 above, the depicted embodiment utilizes the

5    method and system of the invention as described in Figs. 1, 3, and 14 to extract,

transform, and load operational student membership data into EDSL. This particular

embodiment relies on the diligence and alacrity, i.e., speed, of the data stewards to

ensure quality of the data stored within EDSL and on the accuracy, currency and

completeness of the stewards' data filter rules, transformation rules, and business rules.

10    To facilitate the data stewards' tasks, a staging database is employed. The staging

database contains reference data tables and domain tables that store the valid set of

operational code and decision support code values. The domain tables also contain the

data transformation rules. Furthermore, the staging database contains various work

tables, tables of data anomalies, and output tables for refreshing the EDSL repositories.

15    EDSL repositories, in this particular embodiment, are comprised of a relational database

and a series of multidimensional data structures.

Embodiments of the system of the invention as shown above are in the form of a

computer or computer system. As used herein, the term "computer" or "computer system"

is to be understood to include at least one processor utilizing a memory or memories. The

20    memory stores of the system of the invention retain at least portions of an executable

24

program code at one time or another during operation of the processor portion of the

computer. Additionally, the processor executes various instructions included in that

executable program code. An executable program code is a set of instructions in machine

language that executes in a particular computer system environment to perform a

5    particular task. The executable program code processes data in response to commands by

a user. As used herein, it will be appreciated that the term "executable program code" and

the term "software" mean substantially the same thing for the purposes of the description

as used herein.

It is to be appreciated that to practice the system and method of the invention, it is

10   not necessary that the various processors and/or the memories used in the practice of the

invention be physically located in the same place. That is, it should be appreciated that

each of the processors and the memories may be located in geographically distinct

locations and connected so as to communicate in any suitable manner, such as over a

network or the Internet, for example. Additionally, it should be appreciated that each of

15   the processors and/or the memories may be composed of the same or different physical

pieces of equipment. Accordingly, it is not necessary that the processor be one single

piece of equipment in one location and that the memory be another single piece of

equipment in another location. That is, it is contemplated that the a particular processor

may be two pieces of equipment in two different physical locations. The two distinct

20   pieces of equipment may be connected in any suitable manner. Additionally, a particular

memory used in the invention may include two or more portions of memory in two or

more physical locations. Further, the memory could include or utilize memory stores from

the Internet, Intranet, Extranet, LAN, satellite interface or some other source or over some

other network, as may be necessary or desired.

5        As described above, the method of the invention may illustratively be embodied in

the form of a computer or computer operating system. It is to be appreciated that the

software or programs that enable the computer operating system to perform the operations

described above may be supplied on any of a wide variety of data holding media. Further,

it should be appreciated that the implementation and operation of the system and method

10      of the invention may be in the form of computer code written in any suitable programming

language or languages, which provide instructions to the computer by which the computer

may manipulate data.

It should be appreciated that the software code or programming language that is

utilized in a computer system to perform the above described invention may be provided

15      in any of a wide variety of forms. Illustratively, the software may be provided in the form

of machine language, assembly code, target language, object code, source code or source

language, as well as in other forms. Further, the software may be in the form of

compressed or encrypted data utilizing a suitable compression or encryption algorithm.

Additionally, it should be appreciated that the particular medium utilized to hold

20      either the software used in conjunction with the invention or the data, which is

manipulated by the software, may take on any of a variety of physical forms.

Illustratively, the medium may be in the form of a compact disk, a DVD, an integrated

circuit, a hard disk, a floppy diskette, a magnetic tape, a RAM, a ROM, or a remote

transmission, as well as any other medium or source of information that may be read by a

5      computer or other operating system.

Accordingly, the software of the method of the invention may be provided in the

form of a hard disk or be transmitted in some form using a direct telephone connection,

the Internet, an Intranet, or a satellite transmission, for example. Further, the

programming language enabling the system and method of the invention as described

10     above may be utilized on all of the foregoing and any other medium by which software or

executable program code may be communicated to and utilized by a computer or other

operating system.

As described herein, the system and method of the invention may utilize an

application program, a collection of separate application programs, a module or modules

15     of a program, or a portion of a module of a program, for example. As noted above, it

should be appreciated that the computer language used in the system and method of the

invention may be any of a wide variety of programming languages. Further, as is also

noted above, it is not necessary that a single programming language be utilized in

conjunction with the operation of the system and method of the invention. Rather, any

20     number of different programming languages may be utilized as is necessary or desirable.

As described above, in the system and method of the invention, a variety of user

interfaces are utilized. A user interface may be in the form of a dialogue screen for

example. As used herein, a user interface includes any software, hardware or combination

of hardware and software used in an operating system that allows a user, or other person,

5      to interact with the operating system. A user interface may include any of a touch screen,

keyboard, mouse, voice recognition device, dialogue screen, menu box, a list, a checkbox,

a toggle switch, a pushbutton or any other object that allows a user to receive information

regarding the operation of the program and/or provide the operating system with

information. Accordingly, a user interface used in conjunction with the system and

10     method of the invention may be any device or collection of devices that provides

communication between a user and a computer. The information provided by the user to

the computer through the user interface may be in the form of a command, a selection or

data, or other input, for example.

A user interface is utilized by an operating system running an application program

15     to process data for a user. As should be appreciated, a user interface is typically used by a

computer for interacting with a user either to convey information or receive information.

However, it should be appreciated that in accordance with the system and method of the

invention, it is not necessary that a human user actually interact with a user interface.

Rather, it is contemplated that the user interface of the invention may interact, i.e., convey

20     and receive information, with another operating system or computer, rather than a human

user. Further, it is contemplated that the user interfaces utilized in the system and method

of the invention may interact partially with another operating system while also interacting

partially with a human user.

It should be appreciated that although the system and method of the present

5   invention has been described herein in the context of particular implementations in

particular environments for particular purposes, those of ordinary skill in the art will

recognize that the usefulness of the system and method of the invention is not limited

thereto and that the present invention can be beneficially implemented in any number of

environments for any number of purposes.

10   It will be readily understood by those persons skilled in the art that the present

invention is susceptible to broad utility and application. Many embodiments and

adaptations of the system and method of the present invention other than those herein

described, as well as many variations, modifications and equivalent arrangements, will be

apparent from or reasonably suggested by the present invention and foregoing description

15   thereof, without departing from the substance or scope of the invention.

Accordingly, while the present invention has been described here in detail in

relation to its exemplary embodiments, it is to be understood that this disclosure is only

illustrative and exemplary of the present invention and is made merely for the purposes of

providing a full and enabling disclosure of the invention. The foregoing disclosure is not

20   intended to be construed or to limit the present invention or otherwise to exclude any other

such embodiments, adaptations, variations, modifications and equivalent arrangements,

the present invention being limited by the claims and the equivalents thereof.